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Heffron, Raphael J.; Downes, Lauren; Bysveen, Marie; Brakstad, Elisabeth V.; Mikunda, Tom; Neele, Filip

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# Ownership, Risk & the Law for a CO<sub>2</sub> Transport Network for Carbon Capture and Storage in the EU

## Authors:

Raphael J Heffron,<sup>a\*</sup> Lauren Downes,<sup>a</sup> Marie Bysveen,<sup>b</sup> Elisabeth Vågenes,<sup>b</sup> Tom Mikunda,<sup>c</sup> Filip Neele,<sup>c</sup> Charles Eickhoff,<sup>d</sup> David Hanstock,<sup>d</sup> and Diana Schumann<sup>e</sup>

<sup>a</sup>Queen Mary University of London, United Kingdom

<sup>\*</sup>Now, the Centre for Energy, Petroleum, and Mineral Law and Policy, University of Dundee, UK

<sup>b</sup>SINTEF Energy Research, PO Box 4761 Sluppen, NO-7465, Trondheim

<sup>c</sup>TNO, Princetonlaan 6, 3584 CB Utrecht, The Netherlands

<sup>d</sup>Progressive Energy Ltd, Swan House, Bonds Mill, Stonehouse, United Kingdom

<sup>e</sup>Forschungszentrum Jülich GmbH, Germany

**Corresponding Author:** *Raphael J Heffron* [r.heffron@dundee.ac.uk](mailto:r.heffron@dundee.ac.uk)

## Abstract:

The transboundary transportation of CO<sub>2</sub> gives rise to international legal issues not faced in other standalone Carbon Capture Storage (CCS) projects or domestic projects. While the EU CCS Directive establishes a framework for CCS, it does not address transboundary transportation with specificity. Moreover, unlike the U.S. and Canada, where a federal ‘hook’ enables streamlined regulation of transboundary CO<sub>2</sub> pipelines, such a regime is lacking in the EU currently. This will require participating Member States to agree a statutory framework for CO<sub>2</sub> transport, which addresses issues at the international, national and local levels of law. In this paper, several key issues for developing and resolving legal issues around ownership and risk are examined using a ‘pilot’ project to explore specific examples of this. Further, potential partnership arrangements from a legal and policy perspective, and in the penultimate section, communication plan is advanced, which sets out key issues to be addressed with Member States when partnerships must be established. Finally, while this research presents a legal perspective on the next steps for risk and ownership for CO<sub>2</sub> transport, the analysis was developed with an interdisciplinary research team and further through key industry stakeholder meetings.

**Keywords:** legal risk; CO<sub>2</sub> Transport; CCS; CCS ownership

**Word Count:** 10158

## **1: Introduction**

The EU as part of its plans to develop a cross-border CO<sub>2</sub> transport project that will pave the way for an EU CO<sub>2</sub> transport network and subsequent deployment of CCS in Europe. It is widely assumed that such a CO<sub>2</sub> project – publicly funded, owned and operated by a consortium of governmental bodies in several nations – is a necessity to initiate a first-mover project to enable widespread deployment of CCS in a European context.

This research focuses on the ownership, risk and legal issues of such a CO<sub>2</sub> transport project and the relationship between these three issues. The paper uses an example case of the ‘Rotterdam Nucleus’ that involves both the Netherlands and the UK as a potential pilot project. The Pilot Case would connect CO<sub>2</sub> sources with CO<sub>2</sub> sinks via a transboundary transport network (see Figure 1 in the next section). Transboundary transportation of CO<sub>2</sub> would necessitate the creation of an international statutory framework (between Member States). This paper explores governance and statutory issues as needed at this early stage for the planning, construction, commission and operation of a cross-border gateway project for CO<sub>2</sub> transport.

This paper is structured as follows. First, after a brief overview of the Pilot Case (the Rotterdam Nucleus), we explore considerations for developing a statutory framework for the Pilot Case. Second, we consider project ownership by Member State governments in the Pilot Case, and how public-private ownership in CCS projects are used in other countries. Brief reviews of several international CCS projects are presented: 1) a CO<sub>2</sub> gathering and trunk line transport network (Canada); 2) a CCS project in Australia that has a long operations (and hence liability) phase (Gorgon); and 3) recent recommendations in the UK as to commercial and ownership structures to initiate CCS development.

Next, possible ownership arrangements for the Pilot Case are discussed. Fourth, potential partnership arrangements from a legal and policy perspective, between Pilot Case participants, being between Member States as well as between private sector and Member States. The relevance of PCIs in partnership arrangements is noted. Considerations for allocation and management of risk in the Pilot Case are presented. Fifth, we present a strategy for exploring the legal issues to be discussed with Member States participating in the Pilot Case; establishment of a statutory framework; allocation of risk; and government participation and ownership in the Pilot Case. Finally, this paper concludes with a summary and highlights areas for future research.<sup>1</sup>

## **2: The Legal Framework for the Pilot Case CO<sub>2</sub> Transport Project**

### **2.1: Introduction**

This section reviews the status of the CCS legal and policy frameworks in the EU. First it however, presents the Pilot Case description.

### **2.2: The CO<sub>2</sub> Transport Pilot Case (Rotterdam Nucleus) – Description**

Under the CO<sub>2</sub> Transport Pilot Case (Rotterdam Nucleus) development scenario, CO<sub>2</sub> sources in the Netherlands (Port of Rotterdam) – the ROAD CCS project would be the initial user – would be linked to CO<sub>2</sub> storage facilities located offshore in the Dutch North Sea. Transport infrastructure would be extended to connect high CO<sub>2</sub> hydrocarbon development opportunities

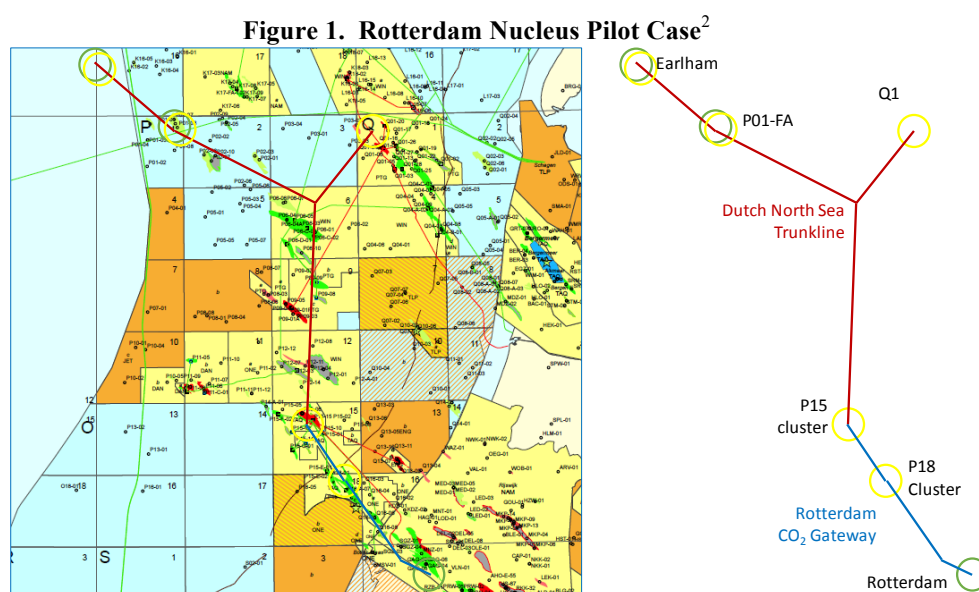
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<sup>1</sup> Financial support for this project from the EU Commission under the H2020 framework programme for research and innovation is highly appreciated.

of the Fizzy field and P1-FA field in the UK North Sea to storage locations offshore the Netherlands (e.g., P18 and P15 storage sites) via a long distance pipeline (see Figure 1).

The development would comprise three pipelines to be delivered simultaneously with a planned operation start date between 2022 and 2024:

1. A short distance pipeline (~ 20km), with an onshore connection to Rotterdam CO<sub>2</sub> collection network.
2. A short distance pipeline (~25km) linking the Maasvlakte Harbour to the P8-A shortage platform (the “**Rotterdam CO<sub>2</sub> Gateway**”).
3. A main spine pipeline of around 130km extending from the Fizzy and P1-FA fields in the UK’s Southern North Sea to the P18 storage facility in the Dutch North Sea (the “**Dutch North Sea Trunkline**”).



### 2.3: EU Policy and CCS

The EU has a goal to reduce greenhouse gas emissions by at least 80% of 1990 levels by 2050.<sup>3</sup> In its *2050 Energy Roadmap*, the European Commission identified CCS as a key technology that could achieve these targets.<sup>4</sup> Broad deployment of CCS to facilitate climate change goals requires infrastructure integration and connectivity. The European Commission has been taking steps to deliver such integration through a number of legislative and policy actions.

The key legislation in this regard is the CCS Directive,<sup>5</sup> which establishes a framework for CO<sub>2</sub> storage across the EU. Article 24 of the CCS Directive, entitled “Transboundary Cooperation”, requires: “In cases of transboundary transport of CO<sub>2</sub>, transboundary storage sites or transboundary storage complexes, the competent authorities of the Member States concerned shall jointly meet the requirements of this Directive and of other relevant Community

<sup>2</sup> GATEWAY Project’s PCI application dated 15 April 2017.

<sup>3</sup> European Commission, ‘Energy roadmap 2050’ (COM(2011) 885 final of 15 December 2011) <[https://ec.europa.eu/energy/sites/ener/files/documents/2012\\_energy\\_roadmap\\_2050\\_en\\_0.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/2012_energy_roadmap_2050_en_0.pdf)>.

<sup>4</sup> European Commission, ‘Energy roadmap 2050’ (COM(2011) 885 final of 15 December 2011) <[https://ec.europa.eu/energy/sites/ener/files/documents/2012\\_energy\\_roadmap\\_2050\\_en\\_0.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/2012_energy_roadmap_2050_en_0.pdf)>.

<sup>5</sup> Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006 (CCS Directive).

legislation”.<sup>6</sup> However, issues remain in cross-border integration of the CCS value chain (i.e., CO<sub>2</sub> capture, transport and geological storage).

For instance, while Member States have transposed the CCS Directive<sup>7</sup> into national law, inconsistencies can be observed among Member State policies and political support for CCS infrastructure projects across the EU. This could hinder CCS transboundary network development, impacting the realization of cross-border projects.<sup>8</sup>

Another essential piece of EU legislation for CCS development is the Trans-European Energy Infrastructure Regulation (TEN-E Regulation).<sup>9</sup> The TEN-E Regulation provides mechanisms to promote connectivity and development of strategic energy infrastructure. CCS is one of the key thematic development areas eligible for classification as Projects of Common Interest (PCI).<sup>10</sup> PCIs are eligible for streamlined approvals and EU funding. The 2017 call for PCI submissions for CO<sub>2</sub> transport projects was issued in March 2017, with applications due 15 April 2017.<sup>11</sup> This was the first opportunity for CCS projects to apply for PCI classification.<sup>12</sup>

CCS as a TEN-E Regulation Priority Thematic Area contemplates a “[c]ross-border carbon dioxide network: development of carbon dioxide transport infrastructure between Member States and with neighbouring third countries in view of the deployment of carbon dioxide capture and storage”.<sup>13</sup> (See also Section **Error! Reference source not found.** below.) Such networks entail “development of carbon dioxide transport infrastructure between Member States and with neighbouring third countries in view of the deployment of carbon dioxide capture and storage”.<sup>14</sup>

## 2.4: Key Legal Issues: The Three Layers of Law

### 2.4.1: The Legal Context

While the EU has enacted the CCS Directive, the Directive focuses largely on governance of CO<sub>2</sub> *storage*, rather than transboundary CO<sub>2</sub> *transportation*. Therefore, a challenge for the potential Pilot Case is the establishment of a regulatory framework appropriate for the project’s transboundary component, and which is suitable to support infrastructure interconnectivity. There are several options by which such a statutory regime could be developed.

The discussion here focuses on transportation and connectivity of CO<sub>2</sub> sources and sinks from the UK to the Netherlands and from Belgium to the Netherlands. Development of a statutory framework to govern the transboundary Pilot Case implicates energy law at the international, national and local levels.<sup>15</sup> That is, energy law is subject to dynamics that occur within three levels of law—international, national and local—in which change at one level influences the

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<sup>6</sup> Directive 2009/31/EC, Article 24.

<sup>7</sup> Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European Parliament and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006 (CCS Directive).

<sup>8</sup> Milieu, ‘Identification of future CO<sub>2</sub> infrastructure networks’ (November 2015, Report for the European Commission ENER/B1/FV2014-731/SI2.639451).

<sup>9</sup> TEN-E Regulation.

<sup>10</sup> TEN-E Regulation, Annex I.

<sup>11</sup> Statement by Katrien Priens of European Commission (email correspondence issuing call for candidate projects of common interest in the area of carbon dioxide transport 1 March 2017).

<sup>12</sup> Ramboll & Ecorys, Report for the European Commission, ‘Support the Selection Process of PCI Candidates in the Thematic Area of Cross-Border Carbon Dioxide Networks: Cost-Benefit Analysis Methodology and PCI Application Template Final Report (21 February 2017).

<sup>13</sup> TEN-E Regulation, Annex I.

<sup>14</sup> TEN-E Regulation, Annex I.

<sup>15</sup> See GATEWAY Deliverable 3.1.

others.<sup>16</sup> In energy law analysis, this entails the application of the Theory of Change in Energy Law.<sup>17</sup> Here, we will consider the relevance and influence of these layers of law for a statutory framework to enable the Pilot Case.

It is important to note that, “[u]nlike the electricity and gas sectors, there is no master plan for the development of an EU-wide CO<sub>2</sub> transport infrastructure network, nor are there imminent plans to establish one”.<sup>18</sup> Accordingly, statutory requirements for the development of a CO<sub>2</sub> transport network explored here are project-specific and account for the possibility of future expansion.

#### **2.4.2: International Law Issues**

As noted previously, Article 24 of the CCS Directive mandates the competent authorities of Member States to cooperate to jointly meet EU legislative requirements for transboundary transport of CO<sub>2</sub> for CCS.<sup>19</sup> International agreements for transboundary transport of CO<sub>2</sub> for the Pilot Case would require an agreement between the Netherlands and the UK to achieve the Fizzy field extension (future expansion scenarios, such as to Belgium or Germany would also require international agreements). Interstate agreements would need to include several items, with many of the important issues highlighted in the sections to follow.

##### ***London Protocol***

The Member States participating in the GATEWAY project Pilot Case would need to overcome the London Protocol restriction. This includes the means by which a solution would be achieved.

Briefly, Article 6 of the London Protocol prohibits treaty signatories from exporting transboundary waste for disposal at sea.<sup>20</sup> Where CO<sub>2</sub> is considered a waste (e.g., in the case of CCS), the London Protocol is a challenge for transboundary CCS projects with offshore CO<sub>2</sub> storage such as the GATEWAY project (as the Member States of the Pilot Case are London Protocol parties).

In the absence of ratification of an amendment to the London Protocol, several proposals for resolving the prohibition have been explored in the literature.<sup>21</sup> One alternative example is

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<sup>16</sup> Raphael J Heffron and Kim Talus, ‘The development of energy law in the 21<sup>st</sup> century: a paradigm shift?’ (2016) 9(3) *Journal of World Energy Law and Business* 189.

<sup>17</sup> Raphael J Heffron and Kim Talus, ‘The development of energy law in the 21<sup>st</sup> century: a paradigm shift?’ (2016) 9(3) *Journal of World Energy Law and Business* 189.

<sup>18</sup> Ramboll & Ecorys, Report for the European Commission, ‘Support the Selection Process of PCI Candidates in the Thematic Area of Cross-Border Carbon Dioxide Networks: Cost-Benefit Analysis Methodology and PCI Application Template Final Report (21 February 2017) 7.

<sup>19</sup> See EC/2009/31, Preamble 39 and Article 24; Options for how this cooperation could be documented would depend on the engagement of the Member States involved, and which was explored in other Work Package 3 Deliverables.

<sup>20</sup> 1996 Protocol to the Convention on the Prevention of Marine Pollution By Dumping of Wastes and Other Matter 1972 (“London Protocol”), Article 6.

<sup>21</sup> IMO, ‘Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter’ <[www.imo.org/en/OurWork/Environment/LCLP/Pages/default.aspx](http://www.imo.org/en/OurWork/Environment/LCLP/Pages/default.aspx)>; International Maritime Organisation (IMO), ‘Carbon Capture and Sequestration’ (2016), <[www.imo.org/en/OurWork/Environment/LCLP/EmergingIssues/CCS/Pages/default.aspx](http://www.imo.org/en/OurWork/Environment/LCLP/EmergingIssues/CCS/Pages/default.aspx)>; Justine Garrett and John McCoy, ‘Carbon capture and storage and the London Protocol: Recent Efforts to Enable Transboundary CO<sub>2</sub> Transfer’ (2013) 37 *Energy Procedia* 7747; Chiara Armeni, ‘Legal Developments for Carbon Capture and Storage under International and Regional Marine Legislation’ in Ian Havercroft, Richard Macrory and Richard B Stewart (eds), *Carbon Capture and Storage: Emerging Legal and Regulatory Issues* (Hart Publishing 2011) 145.

creation of bilateral treaties between Member States (which could pose political risk at an international level).<sup>22</sup>

It has been estimated widespread deployment of CCS in the EU will not occur until at least 2030, in which commercial-scale deployment would be key.<sup>23</sup> This suggests sufficient time for the London Protocol prohibition to be addressed broadly in the EU. However, the timeframe for developing the GATEWAY project Pilot Case would require participating Member States to seek a resolution to this as a matter of priority.

**CCS Directive and Third Party Access**

Chapter 5 of the CCS Directive, entitled ‘Third-Party Access’ seeks to address competition concerns in the CCS sector.<sup>24</sup> Article 21 sets out requirements for third party access to transport and storage facilities, requiring access to be provided in a “transparent and non-discriminatory manner”.<sup>25</sup> Article 22 demands Member States have dispute settlement arrangements for cross-border infrastructure access disputes, an issue which must be contemplated in any transnational legislation governing the Pilot Case (see Table 1).

**Table 1. CCS Article 22**

Third-Party Access. <sup>26</sup>
<p>“[T]he Member State having jurisdiction over the transport network or storage site to which access has been refused shall be applied. Where, in cross-border disputes, more than one Member State covers the transport network or storage site concerned, the Member States concerned shall consult with a view to ensuring that this Directive is applied consistently”.</p>

**Transboundary Cooperation – Appropriate Models**

As mentioned previously, the EU’s CCS Directive focuses largely on CO<sub>2</sub> storage. The CCS Directive requires Member States’ competent authorities to “jointly meet the requirements of this Directive and of other relevant Community legislation”.<sup>27</sup> This implies joint responsibility should be shared between Member States participating in the CCS project.<sup>28</sup>

However, as national laws that govern liability for CO<sub>2</sub> leakage are not standardized, creation of a transboundary statutory regime for CCS would need to be established between Member States.<sup>29</sup>

The North Sea Basin Task Force (NSBTF) is a possible platform in which Pilot Case Member States could establish the regional terms for transboundary CCS infrastructure. The benefits of

<sup>22</sup> IEA, ‘Carbon Capture and Storage and the London Protocol: Options for Enabling Transboundary CO<sub>2</sub> Transfer’ (Working Paper) (Paris: OECD/ IEA 2011) <[www.iea.org/publications/freepublications/publication/CCS\\_London\\_Protocol.pdf](http://www.iea.org/publications/freepublications/publication/CCS_London_Protocol.pdf)>; Rudra V Kapila, ‘Transboundary Chains for CO<sub>2</sub> Enhanced Oil Recovery: Legal Contexts for CO<sub>2</sub> Injection in the North Sea’, Scottish Carbon Capture and Storage Association (31 January 2013) <[www.sccs.org.uk/images/expertise/misc/SCCS-CO2-EOR-JIP-Transboundary.pdf](http://www.sccs.org.uk/images/expertise/misc/SCCS-CO2-EOR-JIP-Transboundary.pdf)> accessed 1 March 2017.

<sup>23</sup> European Commission, ‘Energy roadmap 2050’ (COM(2011) 885 final of 15 December 2011) <[https://ec.europa.eu/energy/sites/ener/files/documents/2012\\_energy\\_roadmap\\_2050\\_en\\_0.pdf](https://ec.europa.eu/energy/sites/ener/files/documents/2012_energy_roadmap_2050_en_0.pdf)>.

<sup>24</sup> Hans Vedder, ‘EC Competition Law and the Organisation of CCS’ in Martha M. Roggenkamp & Edwin Woerdman, *Legal Design of Carbon Capture and Storage: Developments in the Netherlands from an International and EU Perspective* (Intersentia 2009).

<sup>25</sup> EC/2009/31 Article 21.

<sup>26</sup> EC/2009/31 Article 22(2).

<sup>27</sup> CCS Directive, Article 24.

<sup>28</sup> Rudra V Kapila, ‘Transboundary Chains for CO<sub>2</sub> Enhanced Oil Recovery: Legal Contexts for CO<sub>2</sub> Injection in the North Sea’, Scottish Carbon Capture and Storage Association (31 January 2013) <[www.sccs.org.uk/images/expertise/misc/SCCS-CO2-EOR-JIP-Transboundary.pdf](http://www.sccs.org.uk/images/expertise/misc/SCCS-CO2-EOR-JIP-Transboundary.pdf)> accessed 1 March 2017.

<sup>29</sup> *Ibid.* Rudra V Kapila (2013).

establishing a CCS regulatory framework to facilitate transboundary CCS development in the North Sea has been acknowledged elsewhere, with the NSBTF being the logical platform under which to undertake this work.<sup>30</sup> It is noted NSBTF includes Member States who would be participating in the Pilot Case, and so engagement with this organization to support delivery of the Pilot Case project would be a reasonable approach. Moreover, the NSBTF could be of particular relevance for creating a regional regulatory framework for CCS in the North Sea beyond the Pilot Case.

Furthermore, given the extensive experience of natural gas networks regulation in the EU and the expansion of infrastructure connectivity to establish an internal energy market (particularly under the Third Energy Package), the EU's approach to natural gas regulation is perhaps a more relevant reference point for the Pilot Case. The Third Energy Package addressed issues such as ownership unbundling in natural gas and electricity networks.<sup>31</sup> It also established the Agency for the Cooperation of Energy Regulators (ACER) to coordinate energy regulators across the EU to enable cross-border energy transactions.<sup>32</sup> (It is noted ACER is involved in the regulation of gas and electricity PCIs in the TEN-E regulations.)

As CCS and CO<sub>2</sub> transport interconnectivity evolve, and the role of ACER continues to expand such as can be found in the recent recast of the ACER regulation,<sup>33</sup> it would seem ACER would be the logical platform by which to enable regulatory consistency for CO<sub>2</sub> transport in the EU. The results of the 2017 PCI application round for CCS could influence the timing for this intervention. For example, several CCS projects could be developed, resulting in a pan-EU CO<sub>2</sub> transport network in the near term. This would suggest a uniform regulatory approach could be more efficient than a regional one (e.g., NSBTF); consider, for example the European Commission's observations in the Explanatory Memorandum to the recent recast of the ACER regulation, which noted the difficulties presented by lack of Member State coordination and consistency in regulation regionally.<sup>34</sup> Yet, as this option is not in effect for CCS today, the present analysis focuses on treaty-level considerations.

### ***Transboundary Cooperation for the GATEWAY Pilot Case***

Member States participating in CCS projects could incorporate learnings gained in delivering transboundary natural gas projects into any agreements established between the nations. This would be in absence of the European Commission enacting regulation/guidance of CCS beyond that currently provided under the CCS Directive which requires Member States to undertake 'transboundary cooperation' under Article 24. Regulatory considerations such as standard setting are explored further in section 0 below.

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<sup>30</sup> See, e.g., Det Norske Veritas, 'Updated Gap Analysis – Legal, Regulatory and Economical Issues related to Carbon Capture and Storage: Report for the Ministry of Petroleum and Energy – Norway, as input to the North Sea Basin Task Force, Phase II' (DNV Report no 2008 - -185) (2008) <[www.regjeringen.no/globalassets/upload/oed/pdf\\_filer/rapporter/det\\_norske\\_veritas\\_gap-analyse.pdf](http://www.regjeringen.no/globalassets/upload/oed/pdf_filer/rapporter/det_norske_veritas_gap-analyse.pdf)> accessed 1 March 2017; Element Energy, 'One North Sea' (2010, Report for The Norwegian Ministry of Petroleum and Energy and The UK Foreign and Commonwealth Office) <[www.npd.no/en/publications/reports/one-north-sea/6-legal-and-regulatory-issues/](http://www.npd.no/en/publications/reports/one-north-sea/6-legal-and-regulatory-issues/)>.

<sup>31</sup> European Commission, 'Market legislation' <<https://ec.europa.eu/energy/en/topics/markets-and-consumers/market-legislation>> accessed 15 March 2017; see also 'Samuel R. Schubert, Johannes Pollak & Maren Kreutler, *Energy Policy of the European Union* (Palgrave 2016) 152 – 157.

<sup>32</sup> European Commission, 'Market legislation' <<https://ec.europa.eu/energy/en/topics/markets-and-consumers/market-legislation>> accessed 15 March 2017; see also 'Samuel R. Schubert, Johannes Pollak & Maren Kreutler, *Energy Policy of the European Union* (Palgrave 2016) 152 – 157.

<sup>33</sup> See e.g., European Commission, 'Proposal for a Regulation of the European Parliament and of the Council establishing a European Union Agency for the Cooperation of Energy Regulators (recast)' COM(2016) 863 final/2 (30 November 2017).

<sup>34</sup> Explanatory Memorandum accompanying European Commission, 'Proposal for a Regulation of the European Parliament and of the Council establishing a European Union Agency for the Cooperation of Energy Regulators (recast)' COM(2016) 863 final/2 <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52016PC0863R%2801%29> (23 February 2017).



As the Pilot Case presents a staged development scenario with the opportunity for future expansion opportunities, a commercial and political decision would need to be made as to the optimal negotiation framework for the international agreement. For example, a bilateral agreement could be established between the UK and the Netherlands with a separate agreement between the Netherlands and Belgium. Commercial and legal arrangements should consider expansion opportunities, such as extending to Germany or Norway.

It is reasonable to question whether a regional transboundary CCS framework should be established to which future CO<sub>2</sub> exporters are a party, or whether the initial agreement between the UK and the Netherlands serves as the reference case for future international agreements. The advantage of a sectoral framework is it ensures homogeneity of rights and duties. The disadvantage of this approach is the time required for negotiations of multiple parties, including some for whom CCS is not a national priority (e.g., Germany),<sup>35</sup> which could result in delays.

Conversely, the advantage of multiple, separate agreements between CO<sub>2</sub> source countries and CO<sub>2</sub> sink nations is the time-savings on the front end. Agreeing one or two international, bilateral agreements between sovereigns is simpler than a multinational framework. However, the significant downside of this approach is the risk of a complex, and possibly incongruent, framework being developed over time. One way to overcome this risk would be to include back to back obligations in the initial bilateral transit pipeline agreement (e.g., between the UK and the Netherlands), which would be incorporated in future agreements with other nations, including for transit pipelines (i.e., those originating in one nation, crossing a second nation in order to arrive at its destination in another nation).<sup>36</sup>

### ***Multilateral and Bilateral Coordination – Project Development***

Multilateral project development involving several nations would also require coordination. In addition, initiation of a project coordinator at the international level would facilitate a consistent approach to project delivery and operation of transboundary CO<sub>2</sub> transport. (This is similar to the issues facing actors in value chain integration, which is discussed in section **Error! Reference source not found.** below.)

As mentioned previously in section two above, the EU has established a PCI framework to support development of energy infrastructure connectivity. CCS is one area eligible for PCI treatment. The first call for transboundary CCS PCI applications was issued in February 2017, with applications due 15 April 2017.<sup>37</sup> As set out in the TEN-E Regulation, proposed CO<sub>2</sub> transport projects seeking PCI classification “shall be presented as part of a plan, developed by at least two Member States”.<sup>38</sup>

The PCI application for CO<sub>2</sub> transport networks requires the participation of at least two Member States, however, the initial stage of the PCI project may be restricted to one country in which future transboundary transport network expansion is contemplated. This was noted in the recent PCI application report that accompanied the call for proposals for CCS PCI projects, which is set out in Table 2.

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<sup>35</sup> See Deliverable 3.1, which explored the CCS policies of the various countries contemplated in the Pilot Case expansion scenarios.

<sup>36</sup> Energy Charter Secretariat, *Intergovernmental Agreements and Host Government Agreements on Oil and Gas Pipelines – A Comparison* (Energy Charter Secretariat, 2015).

<sup>37</sup> See Ramboll & Ecorys, Report for the European Commission, ‘Support the Selection Process of PCI Candidates in the Thematic Area of Cross-Border Carbon Dioxide Networks: Cost-Benefit Analysis Methodology and PCI Application Template Final Report (21 February 2017); Katrien Priens of European Commission (email correspondence issuing call for candidate projects of common interest in the area of carbon dioxide transport 1 March 2017).

<sup>38</sup> TEN-E Regulation, Annex III.2.

Accordingly, the PCI application process itself encourages bilateral cooperation through the development of a transboundary CO<sub>2</sub> transport plan between at least two Member States. The plan to be developed could serve as the basis for determining the statutory framework for the GATEWAY project going forward.

**Table 2. PCI Application – Explanatory Note Regarding TEN-E Regulation**

**European Commission’s Explanation of the TEN-E Regulation’s Requirement for a Joint Plan and the PCI Application**

“Annex III.2 of the TEN-E Regulation defines the rules for the creation of PCI lists, including that these should be devised by Member States and project promoters....The plan that needs to be developed by the two Member States does not form part of the PCI application template; however it is something without which the application cannot progress”<sup>39</sup>

“This confirms that at least two countries must be involved in developing a plan, regardless of whether the proposed PCI physically crosses a border; and that applications must be able to demonstrate a significant cross-border impact for their proposed infrastructure.

Parameters for determining ‘*significant cross-border impact*’ are not outlined in the legislation for CO<sub>2</sub> projects, contrary to other energy infrastructure priority corridors where quantitative minimum thresholds are set. The early stage of market and planning development in the CO<sub>2</sub> sector makes it difficult to set an equivalent threshold. The significance of the impact can be understood in broader terms, such as unlocking significant storage capacity, or laying the grounds for significant future development of cross-border networks. As such, single-country projects may still be eligible for PCI status, as long as they are relevant to more than one country and can demonstrate that cross-border connections, or where collaboration in the context of CO<sub>2</sub> transport is planned at a later stage....”<sup>40</sup>

**2.4.3: National Legal Issues**

Since the CCS Directive emphasises *CO<sub>2</sub> storage*, the national law of the relevant Member States of the Pilot Case would be the predominant legal regime for *CO<sub>2</sub> transport* infrastructure.<sup>41</sup> This could increase project complexity and inconsistencies among the laws of the participating Member States of the Pilot Case could arise. Accordingly, establishing a standardized, workable legal regime that encourages investment and stable operations will be important. Ideally, these consistent requirements would be applied across the project life cycle, from construction to decommissioning.

As noted previously, CCS is one of the thematic areas under the TEN-E Regulation in which the aim is to establish interconnectivity of European energy infrastructure. To achieve this objective, the legal regime for the Pilot Case should account for future expansion of the CO<sub>2</sub> transport network beyond the initial Member States of the Pilot Case. This suggests that any regulation of CO<sub>2</sub> transport at the national level would require a coordinated approach to enable consistencies and a legal regime that is future proof. This idea can be observed in Preamble 43 of the TEN-E Regulation, which acknowledged that Union-level action could better realise an interconnected network than could be achieved at Member State level.<sup>42</sup>

<sup>39</sup> Ramboll & Ecorys, Report for the European Commission, ‘Support the Selection Process of PCI Candidates in the Thematic Area of Cross-Border Carbon Dioxide Networks: Cost-Benefit Analysis Methodology and PCI Application Template Final Report (21 February 2017) 4 – 5.

<sup>40</sup> Ramboll & Ecorys, Report for the European Commission, ‘Support the Selection Process of PCI Candidates in the Thematic Area of Cross-Border Carbon Dioxide Networks: Cost-Benefit Analysis Methodology and PCI Application Template Final Report (21 February 2017) 8 (emphasis in the original source).

<sup>41</sup> Martha M Roggenkamp & Edwin Woerdman, ‘Looking Beyond the Legal Uncertainties of CCS’ in Martha M. Roggenkamp & Edwin Woerdman (eds), *Legal Design of Carbon Capture and Storage: Developments in the Netherlands from an International and EU Perspective* (Intersentia 2009).

<sup>42</sup> TEN-E Regulation, Preamble 43.

A reasonable extension of this logic is that a Union-level regulatory framework for CO<sub>2</sub> transport should also be developed to progress the aims of the TEN-E regulation. The European Commission employed a similar approach for interconnectivity of electricity and gas networks through the Third Energy Package, in which it created, inter alia, a European Network for Transmission System Operators (ENTSO).<sup>43</sup> The mandate of ENTSO-E (for electricity) and ENTSO-G (for gas) includes transboundary cooperation for transmission system operators to enable improved cross-border access of energy networks, as well as creation of standardized legal framework for commercial and technical codes.<sup>44</sup>

The Member States participating in the transboundary CCS project could agree the terms of international regulation of the pipeline that crosses their State boundaries. For example, the Member States could agree the law of the State with the most stringent environmental regulations for CO<sub>2</sub> pipelines applies, or that the regulatory authority of one Member State will have oversight of the transboundary CO<sub>2</sub> infrastructure.<sup>45</sup> The uncertainties and complexities of coordinating potentially inconsistent national laws could be enhanced as CO<sub>2</sub> transport networks evolve toward broad distribution. This notion further supports the suggestion that an ENTSO-type coordination would be a useful model for future management of CO<sub>2</sub> transport.

Government incentives and funding, including the allocation of risks and liabilities would also be a relevant consideration for the statutory framework of the Pilot Case. This idea is presented further in section **Error! Reference source not found.** below. However, it is noted here that the common view is government should accept liability in order to encourage private sector participation in the development of CCS.

#### 2.4.4: Local Legal Issues

The final layer law and policy of relevance for transboundary CCS development of the Pilot Case is the local level. As has been observed in other GATEWAY project deliverables and in the PCI application, the pipeline routes for the Pilot Case would largely be based in existing industrial areas and along an existing pipeline corridor. Therefore, minimal negative public perception issues are expected.

However, the longest portion of the pipeline route will be based in the Netherlands. Given onshore CCS development has had a negative history in the Netherlands (i.e., cancellation of Barendrecht CCS demonstration project, which had onshore storage following public objection), public perception of the Pilot Case could influence project success. In addition, public perception at the local level could influence international-level discussions, indeed, public

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<sup>43</sup> See e.g., European Commission, 'Questions and Answers on the third legislative package for an internal EU gas and electricity market' (2 March 2011) <[http://europa.eu/rapid/press-release\\_MEMO-11-125\\_en.htm?locale=en](http://europa.eu/rapid/press-release_MEMO-11-125_en.htm?locale=en)> accessed 6 March 2017; Regulation (EC) No 715/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the natural gas transmission networks and repealing Regulation (EC) No 1775/2005; Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003.

<sup>44</sup> See e.g., European Commission, 'Questions and Answers on the third legislative package for an internal EU gas and electricity market' (2 March 2011) <[http://europa.eu/rapid/press-release\\_MEMO-11-125\\_en.htm?locale=en](http://europa.eu/rapid/press-release_MEMO-11-125_en.htm?locale=en)> accessed 6 March 2017; Regulation (EC) No 715/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the natural gas transmission networks and repealing Regulation (EC) No 1775/2005; Regulation (EC) No 714/2009 of the European Parliament and of the Council of 13 July 2009 on conditions for access to the network for cross-border exchanges in electricity and repealing Regulation (EC) No 1228/2003.

<sup>45</sup> Rudra V Kapila, 'Transboundary Chains for CO<sub>2</sub> Enhanced Oil Recovery: Legal Contexts for CO<sub>2</sub> Injection in the North Sea', Scottish Carbon Capture and Storage Association (31 January 2013) <[www.sccs.org.uk/images/expertise/misc/SCCS-CO2-EOR-JIP-Transboundary.pdf](http://www.sccs.org.uk/images/expertise/misc/SCCS-CO2-EOR-JIP-Transboundary.pdf)> accessed 1 March 2017.

engagement by Member State competent authorities may be necessary to achieve successful international cooperation.

## **2.5: Conclusion**

A statutory framework must be established to support the transboundary CO<sub>2</sub> transport for the Pilot Case, and which addresses issues presented at the international, national and local levels of law. There are a number of mechanisms to achieve this, and the approach will be influenced by the participating Member States' agreed strategy. Regulation could be project-specific, regionally based or even pan-EU. For example, the role of CCS is contemplated in UK energy policy, in which infrastructure connectivity is key. This will have relevance for the Pilot Case, which proposes to connect the UK's Fizzy field to storage sites offshore the Netherlands.

Further and in need of noting is that an environmental impact assessment (EIA) will have to be conducted for the project to receive final approval. Although, one may perceive passing through the EIA process should be relatively straightforward for parts of the proposed Pilot Case (as in the offshore component) some of the public perception concerns that may arise onshore could be significant. Further, and of more importance of the new EIA regime that came into effect in the EU from 16 May 2017. There are a number of major changes (listed below) and these will be in need of investigation by a project promoter of the Pilot Case who proceeds to the EIA process:

- There is now mandatory post-EIA monitoring;
- Independent EIA experts need to be involved in the process;
- Detailed consideration of alternatives (for example in light of below); and
- A number of additional environmental issues have been added, and these include the need for an investigation into the impact of climate change and impact upon public health.

## **3: International Ownership and Risk Assessment for a CO<sub>2</sub> Transport Project**

### **3.1: Introduction**

One of the aims of this paper is to assess candidate owners and to secure the required level of authority within the nations involved. This requires an understanding of the relationship between liability transfer across the CCS value chain and value chain ownership.

The Pilot project would be an international, full value chain CCS project that links multiple CO<sub>2</sub> sources with sinks through a transboundary CO<sub>2</sub> transportation network. This section explores value chain ownership and risk allocation of CCS in countries internationally, which is informative to the Pilot Case. Brief reviews of several projects are presented: 1) a CO<sub>2</sub> gathering and trunk line transport network (Canada); 2) a CCS project in Australia that has a long operations (and hence liability) phase (Gorgon); and 3) recent recommendations in the UK as to commercial and ownership structures to initiate CCS development.

### **3.2: Canada - Alberta Carbon Trunk Line Project**

The Alberta Carbon Trunk Line (ACTL) project in Canada is a CO<sub>2</sub> transport 'backbone' project intended to collect CO<sub>2</sub> emissions from industrial clusters, where CO<sub>2</sub> is transported 240

kilometers via pipeline to the storage site.<sup>46</sup> This connection of CO<sub>2</sub> clusters with storage by way of long distance pipeline is similar to the intended development of the Pilot project.

The ACTL is solely a domestic Canadian project. The pipeline is located within the borders of the province of Alberta, and therefore is regulated at the provincial level.<sup>47</sup> The project is also operated by the private sector, however, funding for the pipeline is provided by both the provincial (Alberta) and Canadian governments.<sup>48</sup> The initial CO<sub>2</sub> sources will be an Agrium fertilizer plant and a bitumen refinery jointly owned by Northwest Upgrading Inc. and Canadian Natural Upgrading Limited.<sup>49</sup> The pipeline and storage are operated by Enhance Energy.<sup>50</sup>

The Alberta government accepts broad long term liability for CO<sub>2</sub> storage (after a closure certificate is issued, following the meeting of certain requirements by the storage operator).<sup>51</sup> This can be found in legislation, which is presented in Table 3 below.

**Table 3: Carbon Capture and Storage Statutes Amendment Act, 2010 (Alberta)**

<b>Section 121(1)</b>
(1) On the Minister issuing a closure certificate to a lessee in respect of an agreement under this Part, the Crown (a) becomes the owner of the captured carbon dioxide injected pursuant to the agreement, (b) assumes all obligations of the lessee (i) as owner and licensee under the Oil and Gas Conservation Act of the wells and facilities covered by that agreement, (ii) as the person responsible for the injected captured carbon dioxide under the Environmental Protection and Enhancement Act, (iii) as the operator under Part 6 of the Environmental Protection and Enhancement Act in respect of the land within the location of the agreement used by the lessee in relation to the injection of captured carbon dioxide, and (iv) under the Surface Rights Act, and (c) releases the lessee from any obligations under section 56(2)(a) with respect to the wells within the location of the agreement used by the lessee in relation to the injection of captured carbon dioxide. <sup>52</sup>

In addition, the Alberta government provides a post-handover indemnity to the storage operator.<sup>53</sup> The transfer of ownership to the government reflects a shared ownership model between the private and public sectors.

<sup>46</sup> Enhance Energy, 'The Alberta Carbon Trunk Line Project Fact Sheet' <[www.enhanceenergy.com/pdf/ACTL/actl\\_fact\\_sheet.pdf](http://www.enhanceenergy.com/pdf/ACTL/actl_fact_sheet.pdf)> accessed 16 February 2017.

<sup>47</sup> Global CCS Institute, 'Canadian laws regulating CO<sub>2</sub> transport for storage' <<https://hub.globalccsinstitute.com/publications/legislation-relating-co2-transport-storage/canadian-laws-regulating-co2-transport-storage>>.

<sup>48</sup> Government of Canada, Natural Resources of Canada, 'Alberta Carbon Trunk Line (ACTL)' (21 January 2016) <<http://www.nrcan.gc.ca/energy/publications/16233>> accessed 16 February 2016.

<sup>49</sup> Global CCS Institute, 'Alberta Carbon Trunk Line ("ACTL") with Agrium CO<sub>2</sub> Stream' (15 September 2016) <[www.globalccsinstitute.com/projects/alberta-carbon-trunk-line-actl-agrium-co2-stream](http://www.globalccsinstitute.com/projects/alberta-carbon-trunk-line-actl-agrium-co2-stream)> accessed 15 February 2017; Global CCS Institute, 'Alberta Carbon Trunk Line ("ACTL") with North West Sturgeon Refinery CO<sub>2</sub> Stream' (15 September 2016) <[www.globalccsinstitute.com/projects/alberta-carbon-trunk-line-actl-north-west-sturgeon-refinery-co2-stream](http://www.globalccsinstitute.com/projects/alberta-carbon-trunk-line-actl-north-west-sturgeon-refinery-co2-stream)> accessed 15 February 2017.

<sup>50</sup> Global CCS Institute, 'Alberta Carbon Trunk Line ("ACTL") with Agrium CO<sub>2</sub> Stream' (15 September 2016) <[www.globalccsinstitute.com/projects/alberta-carbon-trunk-line-actl-agrium-co2-stream](http://www.globalccsinstitute.com/projects/alberta-carbon-trunk-line-actl-agrium-co2-stream)> accessed 15 February 2017; Global CCS Institute, 'Alberta Carbon Trunk Line ("ACTL") with North West Sturgeon Refinery CO<sub>2</sub> Stream' (15 September 2016) <[www.globalccsinstitute.com/projects/alberta-carbon-trunk-line-actl-north-west-sturgeon-refinery-co2-stream](http://www.globalccsinstitute.com/projects/alberta-carbon-trunk-line-actl-north-west-sturgeon-refinery-co2-stream)> accessed 15 February 2017.

<sup>51</sup> Mike Fernandez and others, 'Liability for sequestered CO<sub>2</sub>: the path forward for Alberta' (2013) 37 Energy Procedia 7709.

<sup>52</sup> Carbon Capture and Storage Statutes Amendment Act, 2010 (Alberta) section 121(1).

<sup>53</sup> Carbon Capture and Storage Statutes Amendment Act, 2010 (Alberta) section 121(2).

Alberta's CCS legislation requires storage operators to pay into a stewardship fund at a fee per tonne of CO<sub>2</sub> sequestered. The fund may be used by the government for the purpose of monitoring, environmental obligations and various activities for long-term storage management.<sup>54</sup> This is another means of risk management with the operations-phase project owners/operators providing funding, which could be used by the government as the future owner of the project (post-operations).

### 3.3: Australia - Gorgon

One large commercial scale CCS project is under development in Australia—the Gorgon project, located on the site of a liquefied natural gas (LNG) facility in Western Australia. While the Gorgon project is simpler than the Pilot project in that it is a standalone remote project (rather than a CO<sub>2</sub> transport network), the project liability structure, with risk sharing between government and private parties, is notable.

The Gorgon project is governed by an agreement between the Government of Western Australia and the unincorporated joint venture of the Gorgon LNG project.<sup>55</sup> The project agreement, which is ascribed in legislation, requires CCS as part of the LNG project.<sup>56</sup>

The CCS operator has a long liability period (approximately 40 years), spanning the operation of the LNG project,<sup>57</sup> and liability that further extends to 15 years post-CO<sub>2</sub> injection operations. And similar to other jurisdictions, following the monitoring period and meeting certain conditions, long term liability for CO<sub>2</sub> storage is transferred to the government, in which the government indemnifies the CCS operator.

### 3.4: The United Kingdom

Insights from CCS activities in the UK are also instructive for ownership structures in the Pilot project. The UK government has made a couple of significant, but unsuccessful, attempts to deploy CCS in the UK. Most recently, in 2015, the UK government cancelled the CCS competition, which was a dual FEED competition to deliver full value chain CCS. The program was cancelled at a late stage, shortly before the successful bidder was to be announced, at a cost of £100 million to the UK government. While the program did not deliver an operational CCS facility, learnings were nonetheless gleaned from the commercialization program, which included risk allocation across the value chain as well as between public and private actors.

The two bidders in the UK competition had different commercial approaches for project delivery. One bidder (Shell) proposed one operator across the value chain (capture, transport and storage). The other bidder (Capture Power Limited) was a consortium that sought to establish different owners across the CCS value chain.

With regard to risk allocation across the CCS value chain, the NAO, in its review of the cancellation of UK CCS Competition, observed that the latter model faced a challenge in

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<sup>54</sup> Carbon Capture and Storage Statutes Amendment Act, 2010 (Alberta) section 122; Mike Fernandez and others, 'Liability for sequestered CO<sub>2</sub>: the path forward for Alberta' (2013) 37 Energy Procedia 7709.

<sup>55</sup> Barrow Island Act 2003 (Western Australia); Gorgon Gas Processing and Infrastructure Project Agreement, Barrow Island Act 2003 (Western Australia) Schedule I.

<sup>56</sup> Barrow Island Act 2003 (Western Australia); Gorgon Gas Processing and Infrastructure Project Agreement, Barrow Island Act 2003 (Western Australia) Schedule I.

<sup>57</sup> U.S. Department of Energy, 'International Carbon Capture and Storage Projects Overcoming Legal Barriers' (DOE/NETL – 2006/1236) (23 June 2006) citing Personal communication with John Torkington, Greenhouse/Project Approvals Manager, Gorgon Development, Chevron Australia, June 19, 2006 <<http://hub.globalccsinstitute.com/sites/default/files/publications/159693/International-carbon-capture-storage-projects-overcoming-legal-barriers.pdf>>.

“allocat[ing] risks between the parties covering the different elements of the CCS chain in a way that would enable it to secure external investment”<sup>58</sup>; the Capture Power consortium also struggled to find an operator for CO<sub>2</sub> storage. On the other hand, Shell’s model, in which there was one operator, was a simpler structure that did not have the investment challenges. However, the location of the Shell CCS project was viewed as challenging for future expansion of CCS.<sup>59</sup>

Management of value chain risk in infrastructure development is critical in full chain CCS. Ensuring funding across the value chain is critical, and managing this risk is particularly important where multiple operators are involved in the project. This point was noted in a May 2016 report to the UK Committee on Climate Change (see Table 4 below).

**Table 3. Report to UK Committee on Climate Change.**

How Funding is Allocated to the Three Elements of the CCS Chain
<p>“Funding...can be provided either through a single revenue stream that rewards operation of all three elements (full chain funding), or via two or three revenue streams that reward operation of only part of the chain (part chain funding). Full chain funding appears attractive as it ensures that payments will only be made if carbon is both captured and stored. Part chain funding has the potential for “white elephant” developments, for example, if a transport and storage network is built and not utilised.</p> <p>One of the lessons to come out of the UK CCS competition is the difficulty of financing on the basis of full chain funding. Carbon capture and carbon transport and storage are quite different businesses, requiring different expertise and risks. Financing each element with full chain funding adds significant complexity to business planning, and the pricing in of risk for all parts of the chain into the financing for each element. A single developer, owning all parts of the chain, and financed primarily with equity funds and sufficient contingency funding, would be best placed to absorb the risk of failure of one part of the chain on another. This arrangement was present for one of the competition projects, but was nonetheless still insufficient to reach agreement on funding...</p> <p>Separating funding for capture from the funding for transport and storage, and absorbing some or all cross-chain risk (such as by making funding for each asset dependent only on the performance of that asset), will reduce financing and support costs, lower the barriers for entrants in each sector, and reduce the complexity and timescales of project development. It is less clear whether there is a benefit to separating funding and removing cross-chain risk between transport and storage, which are more closely related than is capture. We consider either choice possible, likely dependent on the business model chosen to deliver CCS, and it may be that different solutions are appropriate for the short and long term.”<sup>60</sup></p>

The UK observation was that separation of ownership (and funding) of the transport and storage stages of the value chain from the capture stage provides a simplicity in commercial structuring. This type of arrangement can also be observed in the ownership structures of other CCS projects presented in this chapter. However, the Pilot project will not have the benefit of this ownership simplicity, as different operators will span the value chain stages. While the commercial structures for the Pilot Case are beyond the scope of this paper, they have been noted here as they are relevant for discussions of partnership arrangements and statutory risk sharing between government and private parties.

<sup>58</sup> National Audit Office, Report by the Comptroller and Auditor General, Department for Business, Energy & Industrial Strategy, ‘Carbon capture and storage: the second competition for government support’ (20 January 2017) 9 <[www.nao.org.uk/wp-content/uploads/2017/01/Carbon-Capture-and-Storage-the-second-competition-for-government-support.pdf](http://www.nao.org.uk/wp-content/uploads/2017/01/Carbon-Capture-and-Storage-the-second-competition-for-government-support.pdf)>.

<sup>59</sup> National Audit Office, Report by the Comptroller and Auditor General, Department for Business, Energy & Industrial Strategy, ‘Carbon capture and storage: the second competition for government support’ (20 January 2017) 9 <[www.nao.org.uk/wp-content/uploads/2017/01/Carbon-Capture-and-Storage-the-second-competition-for-government-support.pdf](http://www.nao.org.uk/wp-content/uploads/2017/01/Carbon-Capture-and-Storage-the-second-competition-for-government-support.pdf)>.

<sup>60</sup> Poyry, ‘A Strategic Approach for Developing CCS in the UK: A report to The Committee on Climate Change’ (May 2016) (Report 2016/346)7 – 8 <[www.theccc.org.uk/wp-content/uploads/2016/07/Poyry\\_-\\_A\\_Strategic\\_Approach\\_For\\_Developing\\_CCS\\_in\\_the\\_UK.pdf](http://www.theccc.org.uk/wp-content/uploads/2016/07/Poyry_-_A_Strategic_Approach_For_Developing_CCS_in_the_UK.pdf)>.

### Lord Oxburgh Model – UK

Following cancellation of the UK CCS Competition in 2015, a UK Parliamentary Advisory Group on CCS issued a report to recommend progress for CCS in the UK (referred to in this paper as the *Lord Oxburgh Report*).<sup>61</sup> Recommendations included an ownership and public-private risk sharing model to initiate CCS development in the UK. The ownership model of the Report is considered here, whereas the risk sharing aspects of the proposal are considered in the next section.

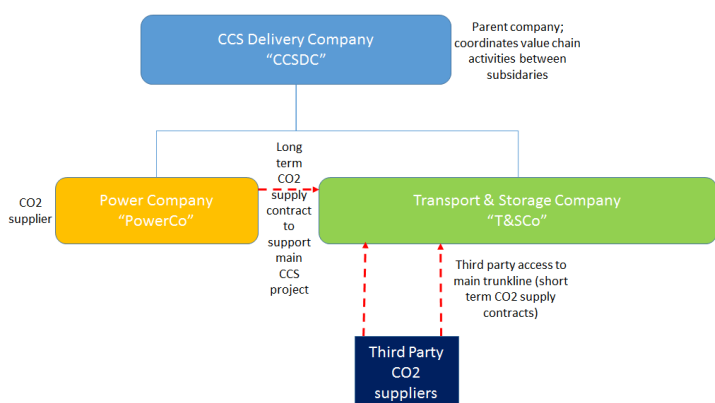
The *Lord Oxburgh Report* proposed the government should establish three government owned companies:

1. A CCS Delivery Company (CCSDC), which is a parent company and acts as a coordinator for the capture, transport and storage activities of the CCS value chain. The CCSDC comprises two subsidiaries—CCS PowerCo (PowerCo) and CCS Transport and Storage Company (T&SCo).
2. PowerCo, would be the power company that supplies CO<sub>2</sub> under a long term contract, thereby ensuring a supply of CO<sub>2</sub> to support the CCS project.
3. T&SCo, would own and operate the transport and storage facilities of the value chain.

The subsidiary companies could be privatized later. In addition, the T&SCo could be further separated (into transport and storage) and privatized. As such, “[s]tate ownership and financing is to be temporary”.<sup>62</sup> The Parliamentary Advisory Group acknowledged that government ownership for large infrastructure projects is not atypical (with analogies being made to the Olympics and Crossrail projects and the role of state-owned businesses in the electricity sector).<sup>63</sup>

The value chain ownership proposal of the Lord Oxburgh report is presented in Figure 2 below.

**Figure 2: Lord Oxburgh Report Ownership Model<sup>64</sup>**



Under the Pilot Case project, CO<sub>2</sub> supply, transport and storage are owned and operated by separate entities/operators. For example, P18, which is a CO<sub>2</sub> storage site in the Netherlands, is

<sup>61</sup> Lord Oxburgh, ‘Lowest Cost Decarbonisation for the UK: The Critical Role of CCS’ (2016) (Report to the Secretary of State for Business, Energy and Industrial Strategy from the Parliamentary Advisory Group on Carbon Capture and Storage).

<sup>62</sup> Lord Oxburgh, ‘Lowest Cost Decarbonisation for the UK: The Critical Role of CCS’ (2016) (Report to the Secretary of State for Business, Energy and Industrial Strategy from the Parliamentary Advisory Group on Carbon Capture and Storage) 30.

<sup>63</sup> Lord Oxburgh, ‘Lowest Cost Decarbonisation for the UK: The Critical Role of CCS’ (2016) (Report to the Secretary of State for Business, Energy and Industrial Strategy from the Parliamentary Advisory Group on Carbon Capture and Storage).

<sup>64</sup> Constructed by the Authors (March 2017).



operated by TAQA, yet TAQA would not be the CO<sub>2</sub> transport operator. A major challenge for the GATEWAY project will be to identify a suitable transport operator and determine allocation of risks across the value chain. This will require the involvement of the participating Member States in the Pilot Case. As stated earlier, the identification of a transport operator is anticipated to occur during the April 2019 to April 2021 timeframe.

Vertically integrated ownership structures (in which one party owns all or most of the value chain) bypass the challenge of transferring risks and liabilities to different operators at each stage of the value chain (e.g., leakage liability, failure of CO<sub>2</sub> delivery). This ownership structure is observed in the ACTL, Gorgon and was proposed for the initial phase of project development in the Lord Oxburgh model. This model was also found in the Peterhead proposal of the UK CCS Competition, in which Shell owned the entire CO<sub>2</sub> value chain.

Yet, even where the CCS value chain is owned by one (or mostly by one) operator, government involvement is still found. That involvement includes financial incentives or support, or ownership of risk (e.g., transfer of post-operation ownership). Thus, allocation of CCS value chain ownership could comprise: 1) government and private parties (either concurrently or sequentially); 2) private parties only; 3) or government only.

As was acknowledged in the *Lord Oxburgh Report*, government will have to accept risk in order to initiate widespread, commercial deployment of CCS. While the government could own the CCS value chain initially, ownership could be transferred at a later date to the private sector, as CCS evolves and risk is reduced. This reveals a shared ownership model for CCS – providing sequential ownership between government and the private sector. In addition, the UK has transcribed the CCS Directive into national law, in which certain liabilities are transferred to the government post-closure of the project.

## **4: Project Partners, Risk & the Law**

### **4.1: Introduction**

The third aim of this paper is to suggest potential partnership arrangements with national authorities from a legal and policy perspective. This section explores partnership arrangements within the context of PCI classification as well as risk allocation across the value chain. Analogies are drawn from other energy sectors.

### **4.2: PCIs and Project Partners**

Two development issues identified by the Pilot project are pertinent to the present discussion of plausible partnership arrangements from the view of law and policy:<sup>65</sup> 1) Obtaining Member State support is an essential component of the project; and 2) Establishing regulatory and liability agreements. In other words, creating full value chain CCS requires risk allocation to be approached from two partnership perspectives.

First, is the establishment of partnerships between 1) the project participants and the Member States; and 2) among the Member States participating in the project. This includes creating a standardized regulatory approach for the transboundary aspects of the project (i.e., CO<sub>2</sub> transport), as well as managing risk across the CCS value chain.

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<sup>65</sup> Tom Mikunda & Filip Neele, TNO, 'Projects of Common Interest and the Rotterdam Nucleus Business Case' Presentation at GATEWAY Stakeholder Meeting in London, UK (27 February 2017).

It is notable that for PCI eligibility, the project need not cross Member State borders, but rather it must have a “significant cross-border impact”.<sup>66</sup> As explained in the Final Report that accompanied the call for proposals for CCS PCI applications: [A]t least two countries must be involved in developing a plan, regardless of whether the proposed PCI physically crosses a border; and that applications must be able to demonstrate a significant cross-border impact for their proposed infrastructure”.<sup>67</sup> From a partnership perspective, the Project Promoter for the development of the Pilot Case should seek the support of the Member States participating in the CCS project. This point will be considered again later in this section.

Second, establishing partnerships between public (government) and private actors through the allocation of risk and provision of incentives such that infrastructure investment is attracted and retained (risk into the value chain). Risk allocation in project partnerships will be explored more fully in the following sections.

### 4.3: Risk Allocation Between Government and Project Participants

Allocation of risk between public and private actors is related to the ownership model of the project, which was explored in section 2 and 3 above, particularly where government has ownership of all or part of the CCS value chain. Recent reviews, activities, and recommendations from the UK are informative of the rationale for allocation of risk between the private and public sectors. The following discussion has relevance beyond CCS projects subject to PCI treatment, as not all full value chain CCS projects will be developed as PCIs.

Risk allocation was one issue considered by the NAO in its review of the UK CCS competition that was cancelled in 2015 (see Table 5 below):

**Table 5: Risk Allocation in CCS Competition.**

**NAO’s View**<sup>68</sup>

“Government taking a greater share of the risk could reduce delivery costs but would expose taxpayers to losses in the event of risks materialising. Investors’ required return reflects the level of risk they are exposed to; if the government carried more of the risk, investors would require lower returns, potentially reducing the costs to build the first CCS facilities. The downside of this approach is that the government, and therefore taxpayers, would be exposed if risks materialised. When designing the competition, the Department ruled out the option of government carrying more risk through ownership or part-ownership of projects at the first stage of its options appraisal, as this conflicted with government policy that the private sector should lead on investment in new energy infrastructure and bear the majority of risk.”

The notion that government should bear more risk to encourage investment in CCS was recommended by the Parliamentary Advisory Group on CCS in the *Lord Oxburgh Report*. The report recommended that the UK government should establish a CCS delivery company (a

<sup>66</sup> TEN-E Regulation, Article 4 1.(c); Ramboll & Ecorys, Report for the European Commission, ‘Support the Selection Process of PCI Candidates in the Thematic Area of Cross-Border Carbon Dioxide Networks: Cost-Benefit Analysis Methodology and PCI Application Template Final Report (21 February 2017).

<sup>67</sup> Ramboll & Ecorys, Report for the European Commission, ‘Support the Selection Process of PCI Candidates in the Thematic Area of Cross-Border Carbon Dioxide Networks: Cost-Benefit Analysis Methodology and PCI Application Template Final Report (21 February 2017) 8.

<sup>68</sup> National Audit Office, Report by the Comptroller and Auditor General, Department for Business, Energy & Industrial Strategy, ‘Carbon capture and storage: the second competition for government support’ (20 January 2017) 35 <[www.nao.org.uk/wp-content/uploads/2017/01/Carbon-Capture-and-Storage-the-second-competition-for-government-support.pdf](http://www.nao.org.uk/wp-content/uploads/2017/01/Carbon-Capture-and-Storage-the-second-competition-for-government-support.pdf)>.

parent company) comprising two separate subsidiaries: 1) PowerCo which will deliver power stations (CO<sub>2</sub> source) and 2) T&SCo which manages transport and storage.<sup>69</sup>

The rationale for this proposed model was that a first project should be full chain to initiate CCS deployment, but once multiple sources and sinks are connected, then flexibility in the ownership model could be introduced. In addition, the Parliamentary Advisory group opined that “[f]ull-chain risk is a risk the private sector cannot take, or cannot cost-effectively take, on the first projects. Taking early full-chain risk is a key reason for the formation of the [CCS delivery company]”.<sup>70</sup>

Following from the *Lord Oxburgh Report*, in February 2017, a report was issued by Teesside Collective and Poyry Management Consulting for the development of an industrial CCS project in northeast England (Teesside Collective Report).<sup>71</sup> The proposal was based on the model presented in the *Lord Oxburgh Report*, in which the government shares much of the project risk. The report “proposes a business model that could make cost-effective, near-term investment in CCS attractive to the Government and to Energy Intensive Industries (EIIs) and so form a basis to enable the Government and industry to jointly to take forward delivery of Industrial CCS”.<sup>72</sup> Under the Teesside Collective proposal, the government is assigned the risk for T&SCo activities, whereas government and industry share the risk for capture facilities. Industry supplies the CO<sub>2</sub>.<sup>73</sup>

As such, the Teesside Collective report focuses on the commercial aspects of project delivery. The commercial structures are beyond the scope of the current paper and this section, which examines partnership arrangements from the perspective of law and policy.<sup>74</sup> However, one aspect of the Teesside Collective report is particularly salient to the current discussion, and that is the idea that in structuring value chain integration for CCS, the financial and technological capacity of the participants is relevant. As explained in the Teesside report:

“As a group, EIIs do not have the financial capacity of oil & gas companies or traditional energy utilities, and initiatives to decarbonise these industrial sectors have to recognise their financial attributes. In particular, EIIs almost universally do not have the balance sheet strength to take on significant liabilities, such as the carbon cost liability in the unlikely event of a CO<sub>2</sub> leakage from the carbon store. Any viable business model for industrial CCS has to recognise this”.<sup>75</sup>

This observation highlights that robust policy and legal structures to encourage CCS investment and enable full value chain integration should consider the risk appetite of the project participants. That is, a one size fits all policy framework may not be suitable.

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<sup>69</sup> Lord Oxburgh, ‘Lowest Cost Decarbonisation for the UK: The Critical Role of CCS. Report to the Secretary of State for Business, Energy and Industrial Strategy from the Parliamentary Advisory Group on Carbon Capture and Storage (CCS)’ (2016).

<sup>70</sup> Lord Oxburgh, ‘Lowest Cost Decarbonisation for the UK: The Critical Role of CCS. Report to the Secretary of State for Business, Energy and Industrial Strategy from the Parliamentary Advisory Group on Carbon Capture and Storage (CCS)’ (2016) 28.

<sup>71</sup> Poyry & Teesside Collective, ‘A Business Case for a UK Industrial CCS Support Mechanism: A report on behalf of and in partnership with Teesside Collective’ (February 2017) <[www.teessidecollective.co.uk/wp-content/uploads/2017/02/0046\\_TVCA\\_ICCSBusinessModels\\_FinalReport\\_v200.pdf](http://www.teessidecollective.co.uk/wp-content/uploads/2017/02/0046_TVCA_ICCSBusinessModels_FinalReport_v200.pdf)>.

<sup>72</sup> Poyry & Teesside Collective, ‘A Business Case for a UK Industrial CCS Support Mechanism: A report on behalf of and in partnership with Teesside Collective’ (February 2017) 1 <[www.teessidecollective.co.uk/wp-content/uploads/2017/02/0046\\_TVCA\\_ICCSBusinessModels\\_FinalReport\\_v200.pdf](http://www.teessidecollective.co.uk/wp-content/uploads/2017/02/0046_TVCA_ICCSBusinessModels_FinalReport_v200.pdf)>.

<sup>73</sup> See proposed commercial on page 18 of the Teesside Collective Report.

<sup>74</sup> In addition, it is noted that GATEWAY Deliverable 4.3, which is being developed concurrent to the present paper, presents the business case for the Pilot Case.

<sup>75</sup> Poyry & Teesside Collective, ‘A Business Case for a UK Industrial CCS Support Mechanism: A report on behalf of and in partnership with Teesside Collective’ (February 2017) 11 <[www.teessidecollective.co.uk/wp-content/uploads/2017/02/0046\\_TVCA\\_ICCSBusinessModels\\_FinalReport\\_v200.pdf](http://www.teessidecollective.co.uk/wp-content/uploads/2017/02/0046_TVCA_ICCSBusinessModels_FinalReport_v200.pdf)>.

#### **4.4: Risk Allocation Across the Value Chain**

The allocation and management of risk across the value chain, and which involve public and private actors also have implications for plausible partnership arrangements. We collected stakeholders' views on how risk should be shared between the private and public sector in the value chain.<sup>76</sup> This brief questionnaire conducted in the February 2017 stakeholder engagement meeting reveals a general consistency in opinions among CCS stakeholders. That is, generally, government should bear the long-term liability risk for CO<sub>2</sub> storage, while CCS operators should manage the risk during the operations phase of the project.

Assuming the Pilot project is classified as a PCI, determination of cost sharing structures between government and private sector participants will need to occur during the April 2019 to April 2021 timeframe. However, discussions with governments will need to occur in the months and years leading to this decision, requiring involvement of both the UK and Dutch governments. These should be held with the above explored country contexts and dynamics in mind, and also that those timeframes are already upon us.

### **5: Timelines & Legal Strategy**

#### **5.1: Introduction**

The final aim of this paper is to provide a legal strategy for developing project partners and allocating risk with national authorities. This includes the development of a timeline which will be instructive in terms of thinking of the legal hurdles for the potential of a Pilot project for CO<sub>2</sub> transport in the EU and when it is likely to happen.

#### **5.2: The Timeline**

As can be seen below in Figure 2, there is a potential misalignment between the project's legal milestones and technical milestones, particularly with regard to the EIA process. However, in terms of the Pilot project it is of benefit the ROAD project completed an EIA in 2011. The content of this should be updated for a new application and under new EIA regulations. In addition, it should be noted that the timelines below are merely estimates. The actual timing for resolution of these issues could vary—particularly as they involve negotiations between sovereigns in which negotiation timeframes could be influenced by other factors.

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<sup>76</sup> This was collected at the Gateway Stakeholder engagement meeting in February 2017.

**Figure 2 A Preliminary Prediction of the Legal Timeline for Development of a PCI CCS project**

	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
<b>Member State Support for PCI application</b>	First call for CCS PCI proposals due 15 April 2017 →														
<b>Form of Agreement, Contracting Strategy for Statutory Framework</b>	Pilot Case States to decide Form of Agreement and Contracting Strategy for Statutory Framework →														
<b>Determine and Agree Ownership Structures</b>	X														
<b>Resolution of London Protocol for Pilot Case</b>	Pilot Case States to agree and resolve London Protocol restriction →														
<b>Develop Statutory Framework and implementation</b>	States negotiate and agree statutory framework for transboundary CO2 transport →														
<b>Social Licence</b>	Ongoing development of social licence to operate CCS →														
<b>EIA</b>	EIA process begins and expected time is 6 years given EIA applications may need to be submitted in multiple jurisdictions and outcomes of one may affect others (so delay is factored in) →														
<b>Development of Pan-EU Framework for CO2 Transport</b>	Broadening of statutory framework to regional or Pan-EU (as appropriate) →														
<b>Proposed trunkline construction to startup period (as per projected timeline in GATEWAY PCI application)</b>	Trunkline construction and startup														

### 5.3: Member State Support

Support of the Member State governments of the countries involved in the Pilot Case (i.e. the Netherlands and UK initially) would be necessary (Project Member States). Having one Member State lead in engaging other national governments would be useful for efficient resolution of international law issues.

In the Pilot projects, the Netherlands is the primary host country (having both storage facilities and CO<sub>2</sub> infrastructure). Therefore, it would be logical for the project promoter to approach the government of the Netherlands initially, given the fundamental role of this nation in the Pilot Case and PCI application. Ultimately, the decision as to which country should lead in engaging other participating Member States, or the project promoter seeks the initial support of another country will be a commercial and political one.

The Pilot project's current project development proposal focuses on the Netherlands with the first transboundary link being between the UK and the Netherlands (Fizzy extension). Therefore, it would be prudent to encourage dialogue between the governments of the UK and Netherlands to progress discussions on matters of international law in the other items of this communication plan.

## 5.4: Timeline in Detail

### (i) Q2 2017

#### *PCI Participation*

The PCI classification process needed submission by April 2017 for which there were three CCS related applications submitted. A test for PCI classification is not whether a proposed project will cross an international boundary between Member States, but rather whether the project would have a 'significant cross-border impact'. This will require early participation and coordination of at least two eligible countries relevant to the Pilot Case.

### (ii) 2016 – Q2 2017

#### *Form of Agreement – Statutory Framework and Contracting Strategy*

The form(s) of agreement that Member States will use to establish a regulatory and statutory regime to enable the transboundary transport of CO<sub>2</sub> for A Pilot project must be agreed.

Any international agreements should be structured in a format that provides flexibility and accounts for future expansion efforts, thereby readily enabling participation of additional Member States. However, the form and format of these agreements between sovereigns will be determined ultimately by those governments.

The form of agreement could be documented through one or several of the following options:

- Multilateral or bilateral treaties among or between the Participating Member States;
- Framework Agreement (e.g., similar to the UK/Norway Framework Agreement, which addresses transboundary upstream petroleum infrastructure); or<sup>77</sup>
- Non-binding Memorandum of Understanding which sets out the agreed international principles concerning CCS.

In addition, the form of agreement would also be influenced by the discussion platform for international engagements. For example, if the Pilot project Member States elect to establish the statutory regime multilaterally, with consideration for other CCS projects or future expansion of the Pilot Case either regionally or more broadly, then they may decide to do so through a platform such as the NSBTF.

Therefore, participating Member States should decide the form of agreement for international legal issues, as well as the appropriate platform for discussions and for establishing the international agreement.

### (iii) Possible Timing: 2017 - 2018

#### *International Matters – London Protocol*

Pilot project Member States, as signatories to the London Protocol, will need to agree how to resolve the London Protocol CO<sub>2</sub> export restriction. This could be documented in the same agreement in which the other international law issues are addressed or separately. Consideration should also be given to the form of agreement as noted above.

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<sup>77</sup> Element Energy, 'One North Sea' (2010, Report for The Norwegian Ministry of Petroleum and Energy and The UK Foreign and Commonwealth Office)  
<[www.npd.no/Global/Engelsk/3%20%20Publications/Reports/OneNorthSea/OneNortSea\\_Final.pdf](http://www.npd.no/Global/Engelsk/3%20%20Publications/Reports/OneNorthSea/OneNortSea_Final.pdf)>.

Resolution of this issue in the near term would be pertinent for the CO<sub>2</sub> exporting Member States and CO<sub>2</sub> storage Member State (Netherlands) of the Pilot Case. Otherwise, investment and operation of the project could be stifled due to CO<sub>2</sub> export being in contravention to the London Protocol. However, in the longer term, it would be sensible that the European Commission takes a leading role to resolve to the London Protocol restriction in order to enable CCS to be deployed more broadly in Europe, requiring offshore storage of CO<sub>2</sub>.

**(iv) Possible Timing: 2018 – 2021**

***Resolution of Cross-Jurisdictional Issues – Statutory Framework Creation and Implementation***

The transboundary nature of the project requires standardization of national laws, which will need to be addressed in the international agreement (in whichever form of agreement is decided) and with legal effect applied at the national and local levels of law, if and where required. As noted previously, there is currently no plan to develop an EU-wide CO<sub>2</sub> network. While a project-specific statutory framework could be created, the participating Member States may wish to consider future expansion possibilities.

- Differences in Member States' national laws and regulations of pipelines and CO<sub>2</sub> purity requirements.
- Means by which to resolve the CCS requirement that Member States must consult to ensure consistent application of the Directive in the event of third party access disputes.

Establishment of international agreements, governing full chain transboundary CCS between sovereigns will take time. This could require an extended period of negotiations and discussions and is subject to variability.

**(v) Possible Timing: 2018 – 2021**

***Ownership Structures***

Ownership structures of the GATEWAY Pilot Case feasibly would require that operatorship of CO<sub>2</sub> transport infrastructure and liabilities are shared between the private and public sectors. Project Member States will need to agree the model for allocation of risk between governments and private sector project participants, accounting for the full CCS value chain and transboundary transportation of CO<sub>2</sub>. Management of risk may also include exploration of insurance instruments to support the private sector.

For the GATEWAY Pilot Case, operation of the CCS value chain is segmented, such that the operator of the CO<sub>2</sub> storage site will be a different entity to CO<sub>2</sub> suppliers and CO<sub>2</sub> transport operator. The participating Member States should consider the Pilot Case's constraints when determining a suitable risk allocation. In doing so, the allocation of risk across the value chain would need to be contemplated by the parties—commercial discussions that are beyond the scope of the current paper.

**(v) Possible Timing: 2018**

***Social Licence***

As stated previously, public support for CCS projects can be critical to project success. Public engagement should be undertaken by participating Member States and project participants. Before final approval of the project, public engagement will occur through the EIA process. Parties may wish to document how this engagement would be undertaken and aligned across

borders in agreements. Member States may wish to explore this item in the international agreements established to govern the Pilot Case (or other transboundary CCS projects).

**(vi) Timing: 2017 - ongoing**

***Evolution of CCS Network***

Beyond the Pilot Case, widespread deployment of CCS in Europe will require the coordination and development of standards for the CCS industry. Ideally, this would be undertaken by a centralized entity (e.g., ACER).

The evolution of the electricity and natural gas sectors in Europe are informative of how regulation of CO<sub>2</sub> transport networks could develop (e.g., unbundling under the Third Energy Package, creation of ACER as a pan-EU coordinator, creation of standards and management efforts of ENTSO-E and ENTSO-G). As mentioned previously, widespread commercial deployment of CCS in Europe is not anticipated until 2030.

**(vii) Possible Timing: 2025+**

***Project Timeline***

Currently, the timeline proposed in the PCI application proposes a series of engineering design activities to commence in the period of 2017 – 2019, followed by construction commencement in 2020 and startup between 2022 and 2024. In Figure 2 above we have expanded on the proposed technical works timeline to include negotiation of partnership arrangements. Negotiation of project-level agreements are also noted to highlight the potential long lead times for the delivery of the commercial and legal arrangements for the CCS project. Figure 2 highlights the expected timeline when factoring in legal processes.

## **6: Conclusion & Future Outlook**

### **6.1: Conclusion**

The aim of this paper was fourfold: (1) to provide a statutory framework for a legal setting to pursue the Pilot Case provided with the required authority and autonomy; (2) to assess candidate owners, and to secure the required level of authority within the nations involved; (3) to suggest potential partnership arrangements from a legal and policy perspective; and (4) to provide a communication plan covering legal issues to be raised when soliciting partnership with national authorities.

This paper highlighted several key issues for developing and resolving legal issues around ownership and risk and utilized a Pilot project to explore specific examples of this. First, the review of the statutory framework for a legal setting to enable the Pilot Case revealed the unique challenges of the Pilot Case when compared to other CCS projects in operation. The transboundary transportation of CO<sub>2</sub> gives rise to international legal issues not faced in other standalone CCS projects or domestic projects. While the CCS Directive establishes a framework for CCS, it does not address transboundary transportation with specificity. Moreover, unlike the U.S. and Canada, where a federal ‘hook’ enables streamlined regulation of transboundary CO<sub>2</sub> pipelines, such a regime is lacking in the EU currently. This will require participating Member States to agree a statutory framework for CO<sub>2</sub> transport, which addresses issues at the international, national and local levels of law.

Second, we considered ownership arrangements and government participation in the Pilot Case. The need for government ownership in a nascent CCS industry has been acknowledged such as in the UK in the Lord Oxburgh report. The sharing of ownership interests between government



and the private sector could be concurrent or sequential. Moreover, ownership interest can vary across the CCS value chain. Ownership has a direct relationship with risk sharing and management between project parties/owners. In the GATEWAY project, the ownership model will exist in a full chain CCS project that traverses the borders of Member States, in which different operators found in each stage of the value chain. This introduces complexity, requiring the participation and agreement of several Member States (initially being the UK and the Netherlands in the Rotterdam Nucleus case). Moreover, the ownership model has to be agreed, the structure of which is currently unknown for the Rotterdam Nucleus.

Next, we explored potential partnership arrangements from a legal and policy perspective. Project support from participating Member States will be essential. This will require the project promoter to seek early support of and participation in the PCI application by Member States.

Finally, a communication plan was advanced, which sets out key issues to be addressed with Member States when partnerships must be established. As resolution of many issues require the agreement of sovereign nations, we highlighted the potential long lead times of these items for early international CCS projects (such as the Pilot project). The extended time periods to resolve international legal matters for CCS could result in project delays. These challenges could be overcome in the future, using a standardized regulatory model (such as observed in the natural gas industry in the EU) as well as the involvement of a transnational coordinator (such as ACER).

## **6.2: Future Research**

Several areas of future research are recommended. One recommended area of investigation is a more detailed consideration of risk management on ownership models in the creation of international statutory frameworks for full chain CCS. ‘Liability’ is a broad term, yet there are many types of liability associated with long-term CCS storage, such as leakage liability or monitoring liability, all liabilities, as well as the legal instruments surrounding these (e.g., indemnification, insurance).<sup>78</sup> This is a further complexity to the creation of a standardized framework for transboundary transport of CO<sub>2</sub>. Lessons from the nuclear energy sector for the CCS industry in terms of the operation of liability could be informative here.

Another area for investigation is the impact of Brexit on delivering connectivity of CCS infrastructure between the UK and Europe. Brexit will evolve in the coming months, which could have a result on the terms by which CCS infrastructure between Europe and the UK is delivered.

It is also recommended that an investigation of best practices of the regulation of CCS in the North Sea is undertaken in the context of expanding this regulatory regime across Europe. The North Sea could evolve to become a CO<sub>2</sub> storage hub for Europe. Where statutory frameworks for CCS projects are developed on a project-by-project or regional basis, the result could be that regional activities dictate outcomes in the Energy Union.

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<sup>78</sup> IEAGHG, ‘Financial Mechanisms for Long-Term CO<sub>2</sub> Storage Liabilities’ (November 2012) <[http://ieaghg.org/docs/General\\_Docs/Reports/2012-11.pdf](http://ieaghg.org/docs/General_Docs/Reports/2012-11.pdf)>.

## APPENDIX 1: ABBREVIATIONS

ACER	European Union Agency for the Cooperation of Energy Regulators
ACTL	Alberta CO <sub>2</sub> Trunk Line
BEIS	UK Department for Business, Energy and Industrial Strategy
CAD	Canadian Dollars
CCS	Carbon Capture and Storage
CEF	Connecting Europe Facility
CO <sub>2</sub>	Carbon Dioxide
CSA	Canadian Standards Association
ECT	Energy Charter Treaty
EII	Energy Intensive Industry
EOR	Enhanced Oil Recovery
EU	European Union
FEED	Front End Engineering and Design
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
LNG	Liquefied Natural Gas
MTPA	Million Tons Per Annum
NAO	National Audit Office
NSBTF	North Sea Basin Task Force
PCI	Project of Common Interest
PHMSA	Pipeline and Hazardous Materials Safety Administration
TEN-E	Trans-European Energy Networks

## APPENDIX 2: STAKEHOLDER INPUT – RISK ALLOCATIONS

In Stakeholder meeting 3 (see appendix 3), we asked participants’ views on how risk should be allocated among project participants in a full value chain CCS project, both during operations and long-term storage. This brief questionnaire conducted in the stakeholder engagement meeting, reveals a general consistency in opinions among CCS stakeholders. That is, generally, government should bear the long-term liability risk for CO<sub>2</sub> storage, while CCS operators should manage the risk during the operations phase of the project.

Stakeholders								
No.	Operation				Storage			
	CO <sub>2</sub> Supplier	Transport	Storage	Govt	CO <sub>2</sub> Supplier	Transport	Storage	Govt
1	30	0	70	0	30	0	70	0
2	0	0	0	100	0	0	0	100
3	0	100	0	0	0	0	0	100
4	30	30	40	0	0	0	20	80
5	60	10	30	0	0	0	0	100
6	20	20	60	0	0	0	0	100
7	30	30	30	10	0	0	30 -50	50 -70

### APPENDIX 3: STAKEHOLDER ENGAGEMENT

This Deliverable was completed with the following points of stakeholder engagement.

- (1) The legal issues at international, national and local level were discussed with Gateway expert project team members at Gateway project meetings over the first 18 months of the project.
- (2) Stakeholder Meetings 1 and 2 were held in Brussels in November 2015 and September 2016, respectively. Work Package 3 (the legal analysis) was highlighted and was discussed. Feedback from the stakeholders was incorporated into the analysis for previous Work Package 3 Deliverables, which also informed the present Deliverable.
- (3) Deliverable 3.3 comprised semi-structured interviews with stakeholders, in which their views of risks of value chain CCS were explored. That research also informed the research for this Deliverable 3.2.
- (4) A further presentation to stakeholders was made at Stakeholder Meeting 3 in London in February 2017. Feedback from the stakeholders at this meeting was incorporated into the analysis for this Deliverable.

Stakeholder attendance has included:

Stakeholder Meeting 1 – November 2015	Stakeholder Meeting 2 – September 2016	Stakeholder Meeting 3 – February 2017
AdeB BP International Limited CCA association E3G European Commission, DG Energy Global CCS Institute Heidelberg Cement Maasvlakte CCS Project CV National Grid Netherlands Enterprise Agency Norwegian Research Council Shell Statoil TAQA The Crown Estate University of Edinburgh ZEP	CCSA CCSA / ZEP Secretariat E3G EU CCS Network European Commission, DG Energy Global CCS Institute Group Technology BP Maasvlakte CCS Project C.V. Shell Statoil Sustainable Decisions Ltd TAQA ZEP	UK CCS Research Council (UKCCSRC) TAQA Maasvlakte CCS Project CV CCS Association International Energy Agency Port of Rotterdam Swift Exploration Dentons